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| 09/425,694      | 10/22/1999  | ROLAND BRUNNER       | BRUNNER-ET-A        | 9906             |

7590 12/16/2003  
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| EXAMINER |
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SONG, MATTHEW J

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| ART UNIT | PAPER NUMBER |
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1765

DATE MAILED: 12/16/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

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|------------------------------|-----------------|----------------|--|
| <b>Office Action Summary</b> | Application No. | Applicant(s)   |  |
|                              | 09/425,694      | BRUNNER ET AL. |  |
|                              | Examiner        | Art Unit       |  |
|                              | Matthew J Song  | 1765           |  |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1) ☒ Responsive to communication(s) filed on 15 September 2003.

2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4) ☒ Claim(s) 1-9 and 11 is/are pending in the application.

4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.

5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.

6) ☒ Claim(s) 1-9 and 11 is/are rejected.

7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.

8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. §§ 119 and 120**

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) ☐ All    b) ☐ Some \*    c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_

4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***Response to Arguments***

1. In view of the appeal brief filed on 9/15/2003, PROSECUTION IS HEREBY REOPENED.

A new grounds of rejection is set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) request reinstatement of the appeal.

If reinstatement of the appeal is requested, such request must be accompanied by a supplemental appeal brief, but no new amendments, affidavits (37 CFR 1.130, 1.131 or 1.132) or other evidence are permitted. See 37 CFR 1.193(b)(2).

***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 1 and 11 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed

invention. Claim 1 recites, “firstly treating the semiconductor wafers in a bath with an aqueous HF solution only containing HF” in lines 4-6. Applicant has attempted to limit the claim by excluding other chemicals. The instant specification does not provide an explicit teaching of “only”; the instant specification merely teaches an HF solution preferably contains HF in a concentration from 0.001% to 2%, note page 3 of the instant specification. The mere absence of a positive recitation is not basis for an exclusion (MPEP 2173.05 (i) Furthermore, the instant specification teaches “optionally HCl and optionally a surfactant”, which contradicts applicant’s “only HF” by the inclusion of other chemicals. Likewise for claim 11.

4. Claims 1 and 11 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 1 recites, “treating the semiconductor wafers in a bath with an aqueous O<sub>3</sub> solution only containing O<sub>3</sub>” in lines 7-8. Applicant has attempted to limit the claim by excluding other chemicals. The instant specification does not provide an explicit teaching of “only”; the instant specification merely teaches an O<sub>3</sub> solution preferably contains O<sub>3</sub> in a concentration from 1-30 ppm, note page 3 of the instant specification. The mere absence of a positive recitation is not basis for an exclusion (MPEP 2173.05 (i) Furthermore, the instant specification teaches “optionally HF”, which contradicts applicant’s “only O<sub>3</sub>” by the inclusion of other chemicals. Likewise for claim 11.

5. Claims 1 and 11 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 1 recites, "treating the semiconductor wafers in a bath with an aqueous HCl solution only containing HCl" in lines 9-10. Applicant has attempted to limit the claim by excluding other chemicals. The instant specification does not provide an explicit teaching of "only"; the instant specification merely teaches an HCl solution preferably contains HCl in a concentration from 0.001%-10%, note page 3 of the instant specification. The mere absence of a positive recitation is not basis for an exclusion (MPEP 2173.05 (i)). Furthermore, the instant specification teaches "optionally O<sub>3</sub>", which contradicts applicant's "only HCl" by the inclusion of other chemicals. Likewise for claim 11.

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

7. Claims 1 and 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 recites, "firstly treating the semiconductor wafers in a bath with an aqueous HF solution only containing HF and optionally HCl and optionally a surfactant" in lines 4-6. It is unclear how a solution containing only HF can contain other chemicals because the limitation contradicts itself. Likewise for claim 11.

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8. Claims 1 and 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 recites, "treating the semiconductor wafers in a bath with an aqueous O<sub>3</sub> solution only containing O<sub>3</sub>" in lines 7-8. It is unclear how a solution containing only O<sub>3</sub> can contain other chemicals because the limitation contradicts itself. Likewise for claim 11.

9. Claims 1 and 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 recites, "treating the semiconductor wafers in a bath with an aqueous HCl solution only containing HCl" in lines 9-10. It is unclear how a solution containing only HCl can contain other chemicals because the limitation contradicts itself. Likewise for claim 11.

***Claim Rejections - 35 USC § 103***

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

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invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

11. Claims 1-9 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pirooz et al (EP 0701275) in view of Verhaverbeke et al (US 6,132,522).

Pirooz et al teaches silicon wafers may be pre-cleaned by being immersed in a SC-1 cleaning solution, which contains about 1000:1:1 to 1:1:1 parts by volume  $\text{H}_2\text{O}:\text{H}_2\text{O}_2:\text{NH}_4\text{OH}$  and has a temperature of about 0-100°C (col 2, ln 30-47). Pirooz et al also teaches metal removal is carried out by immersing the silicon wafer in a bath of an aqueous solution containing about 1:1 to 1:10000 parts by volume  $\text{HF}:\text{H}_2\text{O}$  and to enhance metal removal, the solution may additionally contain  $\text{HCl}$ ,  $\text{H}_2\text{O}_2$  or ozone (col 2, ln 48-60), this reads on applicant's firstly treating the semiconductors in a bath of aqueous  $\text{HF}$  solution only containing  $\text{HF}$  and optionally containing  $\text{HCl}$  and optionally a surfactant. After the metal removal, the silicon wafers are rinsed in deionized water and the rinsed wafers are immersed in a bath containing a bout 0.1-50 ppm ozone at a temperature of about 0-60°C. Optionally, the ozonated water may additionally contain hydrochloric or nitric acid in a volume ratio ranging from about 1:1000 to 1:1 of acid:water (col 3, ln 1-35), this reads on applicant's treating the wafers in a bath with an aqueous  $\text{O}_3$  solution containing  $\text{O}_3$ . Pirooz et al also discloses the treated wafers should be rinsed in deionized water. The final step is drying the wafers by spin-drying and isopropyl alcohol vapor drying techniques (col 3, ln 35-50).

Pirooz et al does not teach treating the semiconductor wafers in a bath with an aqueous  $\text{HCl}$  solution only containing  $\text{HCl}$  and optionally  $\text{O}_3$ .

In a method of wet processing electronic components, note entire reference, Verhaverbeke et al teaches a rinse fluid may be deionized (DI) water or a very dilute aqueous solution of a hydrochloric, hydrofluoric or ozone at a concentration not greater than 100 ppm to prevent metallic deposition on the surface of the electronic component precursors (col 5, ln 1-20). Verhaverbeke et al also teaches a sequential chemical process where electronic component precursors are moved from one reaction chamber to another, wherein each reaction chamber, bath, contains a different reactive chemical process fluid (col 5, ln 35-60 and col 5, ln 17-50). Verhaverbeke et al also teaches that certain baths may contain a rinse fluid but it is required that at least two of the baths in a sequence contain a reactive chemical (col 7, ln 60-67 and col 4, ln 1-10). Verhaverbeke et al also teaches hydrochloric acid, hydrofluoric and ozone are suitable reactive chemical process fluids (col 6, ln 35-60) and the method of sequential chemical processing is applicable to cleaning, stripping and/or etching wafers (col 3, ln 5-15). Verhaverbeke et al also teaches higher output of wafers and significant cost savings is achieved by eliminating the DI rinse between each chemical treatment step (col 4, ln 15-25).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pirooz et al DI water rinsing step with Verhaverbeke et al's rinsing fluid of an aqueous solution of HCl in a bath to prevent metal deposition ('522 col 5, ln 5-15).

Pirooz et al also does not teach these treatment steps form a treatment sequence, which avoids rinsing with water or another treatment liquid and the addition of fresh water or other liquids to the treatment baths.



It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pirooz et al with Verhaverbeke's method of sequential chemical processing without rinsing to increase output and savings ('522 col 4, ln 15-25).

Referring to claims 1 and 11, the combination of Pirooz et al and Verhaverbeke et al teach a first treating a wafer in a bath of aqueous HF ('275 col 2, ln 48-60), treating in a bath of aqueous O<sub>3</sub> ('275 col 3, ln 14-35), then treating the wafers in a bath with an aqueous HCl solution ('275 col 3, ln 35-40 and col 5, ln 1-17), whereby these treatment steps avoid rinsing with water or another treatment liquid and the addition of fresh water or other liquids to the treatment baths ('522 col 3, ln 55 to col 4, ln 7). The combination of Pirooz et al and Verhaverbeke et al teach the HCl step is a rinsing step. However, this step reads on applicant's avoids rinsing, where rinsing is defined to be when a fresh treatment liquid is supplied continuously or at intervals on page 2 of the instant specification, because the HCl is in a bath and not supplied continuously or at an interval. Also, the HCl is at a similar concentration as disclosed by applicant.

Referring to claim 2, the combination of Pirooz et al and Verhaverbeke et al teach an SC-1 treatment ('275 col 2, ln 30-45).

Referring to claim 3, the combination of Pirooz et al and Verhaverbeke et al teach drying ('725 col 3, ln 40-50).

Referring to claim 4, the combination of Pirooz et al and Verhaverbeke et al teach  $(B_1+B_2)+B_3$ , where m is 1.

Referring to claim 5, the combination of Pirooz et al and Verhaverbeke et al does not teach the HF concentration is 0.001-2% by weight. Concentration is well known in the art to be a

result effective variable. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Pirooz et al and Verhaverbeke et al by conducting routine experimentation of a result effective variable to obtain same.

Furthermore, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. (In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235(CCPA 1955)).

Referring to claim 6, the combination of Pirooz et al and Verhaverbeke et al teaches .1-50 ppm of ozone ('275 col 3, ln 25-30). Overlapping ranges is held to be obvious (MPEP 2144.05).

Referring to claim 7, the combination of Pirooz et al and Verhaverbeke et al teaches using ozone to prevent metal deposition ('522 col 5, ln 1-15).

Referring to claim 8, the combination of Pirooz et al and Verhaverbeke et al teach drying by using spin drying, this reads on applicant's centrifuging, and using isopropyl alcohol.

Referring to claim 9, the combination of Pirooz et al and Verhaverbeke et al teaches  $\text{NH}_4\text{OH}$  and  $\text{H}_2\text{O}_2$  ('275 col 2, ln 30-50).

### ***Response to Arguments***

12. Applicant's arguments with respect to claims 1-9 and 11 have been considered but are moot in view of the new ground(s) of rejection.

13. Applicant's arguments filed 9/15/2003 have been fully considered but they are not persuasive.

Applicant's argument that Verhaverbeke et al and Pirooz et al does not teach treating the semiconductor wafers in a bath with an aqueous HCl solution only containing HCl is noted but is not found persuasive. Pirooz et al teaches treating a wafer in O<sub>3</sub> followed by a DI rinse step. Verhaverbeke et al teaches a dilute solution of hydrochloric acid and ozone during rinsing to prevent metallic deposition ('522 col 5, ln 1-15). Therefore, the combination of Pirooz et al and Verhaverbeke et al teach applicant's invention.

Applicant's argument that using baths is not in compliance with Verhaverbeke et al's teaching of directly displacing fluid is noted but is not found persuasive. Verhaverbeke et al does teach displacing volumes, as suggested by applicant. However, Verhaverbeke et al also teaches another embodiment where wafers are moved from one bath to another, wherein each bath contains a different reactive fluid (col 3, ln 55-67 and col 5, ln 15-20). Therefore, Verhaverbeke et al is not limited to displacing volumes to obtain higher output (col 4, ln 15-25), as suggested by applicant.

Applicant's argument that Verhaverbeke et al qualifies as the closest prior art is noted but is not found persuasive. This is mere attorney allegation without evidence, therefore is not found persuasive. The Examiner maintains the Pirooz reference is the closest prior art and Verhaverbeke et al is the secondary reference because Pirooz et al teaches the chemical claimed by applicant.

In response to applicant's arguments against the references individually (pgs 11-12), one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicant's argument that a person of ordinary skill in the art would not combine Verhaverbeke et al with Pirooz is noted but is not found persuasive. Applicant alleges that a person of ordinary skill would not combine a process devoid of water rinsing (Verhaverbeke) with a process, which employs water rinsing (Pirooz). The Verhaverbeke disclosure is entirely devoted to eliminating DI rinsing in conventional process, such as cleaning ,stripping and etching. Verhaverbeke et al also teach higher output and cost saving result from eliminating DI rinses, such as those taught by Pirooz. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the conventional process taught by Pirooz et al, which employs DI rinses with Verhaverbeke et al's method, which eliminates DI rinses to improve output and increase savings.

In response to applicant's arguments against the references individually (pg 19), one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Verhaverbeke et al is relied upon to show the obviousness of using a processing method, which eliminates the need for DI rinse steps. The first and second treatment solution is taught by Pirooz et al.

### ***Conclusion***

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 703-305-4953. The examiner can normally be reached on M-F 9:00-5:00.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 703-305-2667. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Matthew J Song  
Examiner  
Art Unit 1765

MJS

  
NADINE E. NORTON  
PRIMARY EXAMINER